Patuxent River

SAV Distribution

The well-defined linkage between water quality and submerged aquatic vegetation (SAV) distribution and abundance make SAV communities good barometers of the health of estuarine ecosystems (Dennison *et al.*, 1993). SAV is important not only as an indicator of water quality, but it is also a critical nursery habitat for many estuarine species. Blue crab post-larvae are 30 times more abundant in SAV beds than adjacent unvegetated areas (Orth, 1992). Similarly, several species of waterfowl are dependant on SAV as food when they over-winter in the Chesapeake region (Perry and Deller, 1995).

SAV distribution is determined through the compilation of aerial photography directed by the Virginia Institute of Marine Science. Reports detailing methodology and annual SAV coverage are available at www.vims.edu/bio/sav. Details on species of SAV discussed in this report can be found at www.dnr.maryland.gov/bay/sav/key.

Habitat Status

The Chesapeake Bay Program has developed new criteria for determining SAV habitat suitability of an area based on water quality. The "Percent Light at Leaf" habitat requirement assesses the amount of available light reaching the leaf surface of SAV after being attenuated in the water column and by epiphytic growth on the leaves themselves (Kemp *et al.,* 2004). The document describing this new model is found on the Chesapeake Bay Program website (www.chesapeakebay.net/pubs/sav/index.html). The older "Habitat Requirements" of five water quality parameters are still used for diagnostic purposes (Dennison *et al.*, 1993).

Upper Patuxent

The tidal fresh Patuxent River has seen a remarkable growth of SAV since 1993. In fact, 1993 to 1998 saw the SAV coverage exceeding the revised goal of 5 acres, and 1994 to 1998 the SAV abundance was a factor of 20 over the goal (**figure 1**). However, due to weather delays, the aerial survey was not able to cover the upper Patuxent in 1999. The 2003 aerial survey indicated there were 220 acres of SAV, the most ever recorded and 4400% of the revised goal. Ground-truthing by MD-DNR, Patuxent River Park, Jug Bay Wetlands Sanctuary and citizens has found 16 species of SAV in this region with the most commonly identified ones being hydrilla, common waterweed, and coontail. There are 5 water quality monitoring stations in this area (near the Route 4 bridge, the confluence of Western Branch, near the Western Branch Waste Water Treatment Plant, near the ruins of the old railroad bridge at Jug Bay Wetlands Sanctuary and near the confluence of Kings Creek). The data from these sources indicate that most SAV habitat requirements fail for this region (percent light at leaf, light

attenuation, concentration of suspended solids and phosphorous), with only algae levels passing (nitrogen levels are not applicable to the tidal fresh regions) (**figure 2**). The most likely explanation for the growth of SAV even though there are poor water quality conditions is that the plants are growing on very shallow mudflats, which provides them with enough light to grow. Wild celery (*Vallisneria americana*) transplants performed in 1999 and 2000 near the Jackson Landing launch ramp at Patuxent River Park have performed well. In spring of 2000, there were approximately 16 square meters of plants that survived the winter from the 1999 plantings, and the year 2000 transplants had approximately 65% survival. There was evidence of the plants successfully flowering and producing seeds, in addition to tubers (overwinter structures), which was hoped would lead to increased natural recovery in the future. Transplants in 2001 and 2002 and regrowth from previous years did not fair as well, there was excellent growth of the planting area through late summer. However, in the fall, hydrilla smothered the wild celery plants. Plants have not reappeared.

Middle Patuxent

The middle Patuxent area has also seen remarkable re-vegetation in recent years as mapped by the Virginia Institute of Marine Science annual aerial survey. Beginning in 1994, when SAV first reappeared in this region with 53 acres, the SAV coverage increased to 106 acres in 2003 and 2004 or 156% of the revised goal (68 acres) (**figure 1**). Ground-truthing by MD-DNR, Patuxent River Park, and citizens have found 12 species of SAV in this region with the most commonly identified ones being coontail, common waterweed, and curly pondweed. There are two monitoring stations in this area, one near Short Point and the other just north of Cedarhaven. The water quality data from these sites indicates that this region fails most SAV habitat requirements (percent light at leaf, light attenuation, suspended solids, nitrogen, and phosphorous concentrations), with only algae levels passing (**figure 2**).

Lower Patuxent

The lower Patuxent River has not had a recovery similar to the upper two reaches. The VIMS annual aerial survey has found only very small SAV beds (less than 25 acres) since 1987 (**figure1**), though 2002 had 140 acres. This is well below the revised goal of 1,325 acres. There were 42 acres of SAV in 2004. The few beds that have been found in the last 5 years were in the Solomons Island and Hungerford Creek areas. Ground-truthing by citizens, NOAA, EPA, Chesapeake Biological Laboratory and Patuxent River Park staff has found (in order of frequency) horned pondweed, sago pondweed, milfoil, widgeon grass, wild celery and common waterweed. There are 5 water quality monitoring stations in this reach of the Patuxent River, located near Long Point, Jack Bay, mouth of St. Leonards Creek, mouth of Cuckold Creek, and one station between Drum and Fishing Points. Data from these stations indicate that suspended solid, algae, nitrogen and phosphorous levels and light attenuation all pass the SAV habitat requirements (**figure 2**). Percent light at leaf is borderline relative to the habitat requirements.

Several large-scale eelgrass restoration projects occurred in the lower Patuxent in 2004 and 2005. Eelgrass seed was distributed over approximately 3.3 acres near the Chesapeake Biological Laboratory pier, 2.9 acres at Myrtle Point, 0.75 acre at the mouth of Hungerford Creek and approximately 10 acres at Parran's Hollow, just north of Jefferson Patterson Park. Additionally, small adult shoot test plots were installed at each of these locations. Intensive monitoring of recruitment and survival has occurred throughout 2005, those results were not available as this summary was being prepared. Additional monitoring will occur in 2006.

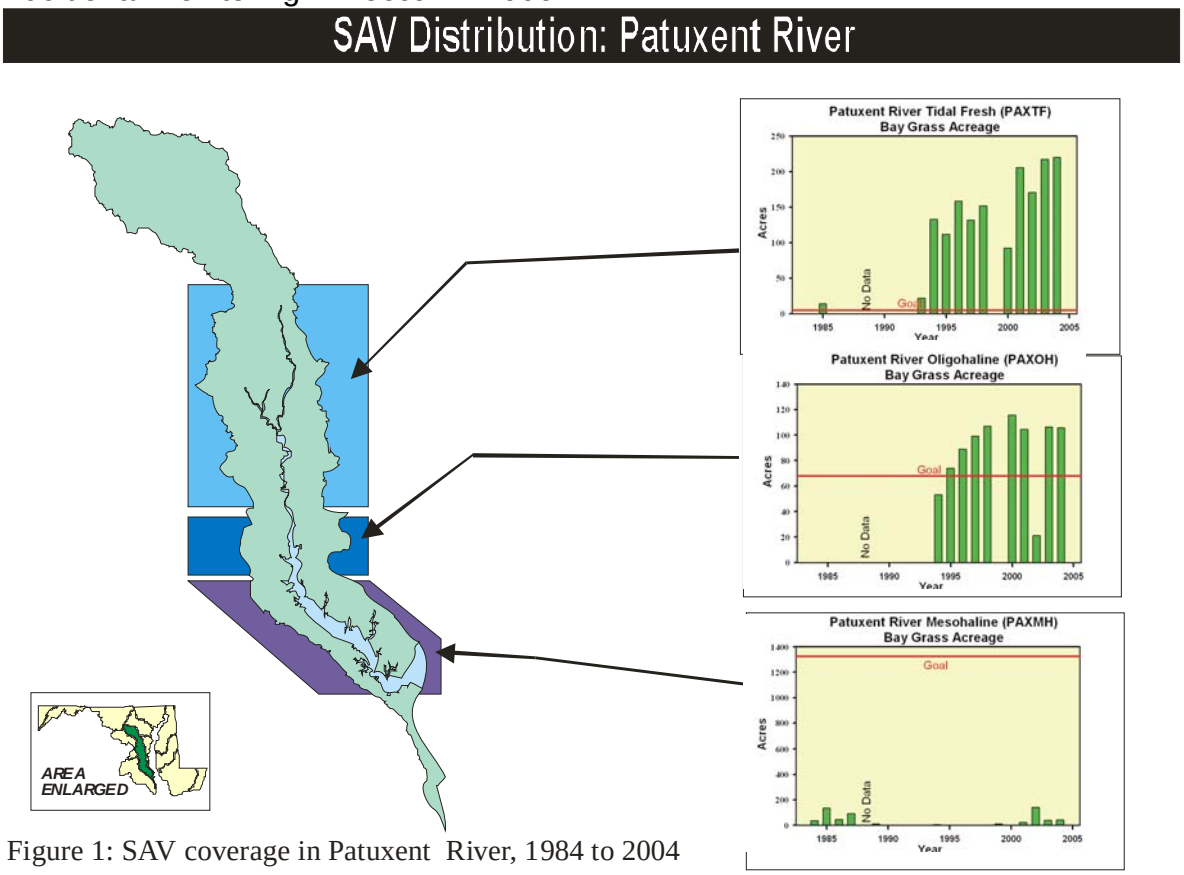

Figure 1: SAV coverage in Patuxent River, 1984 to 2004

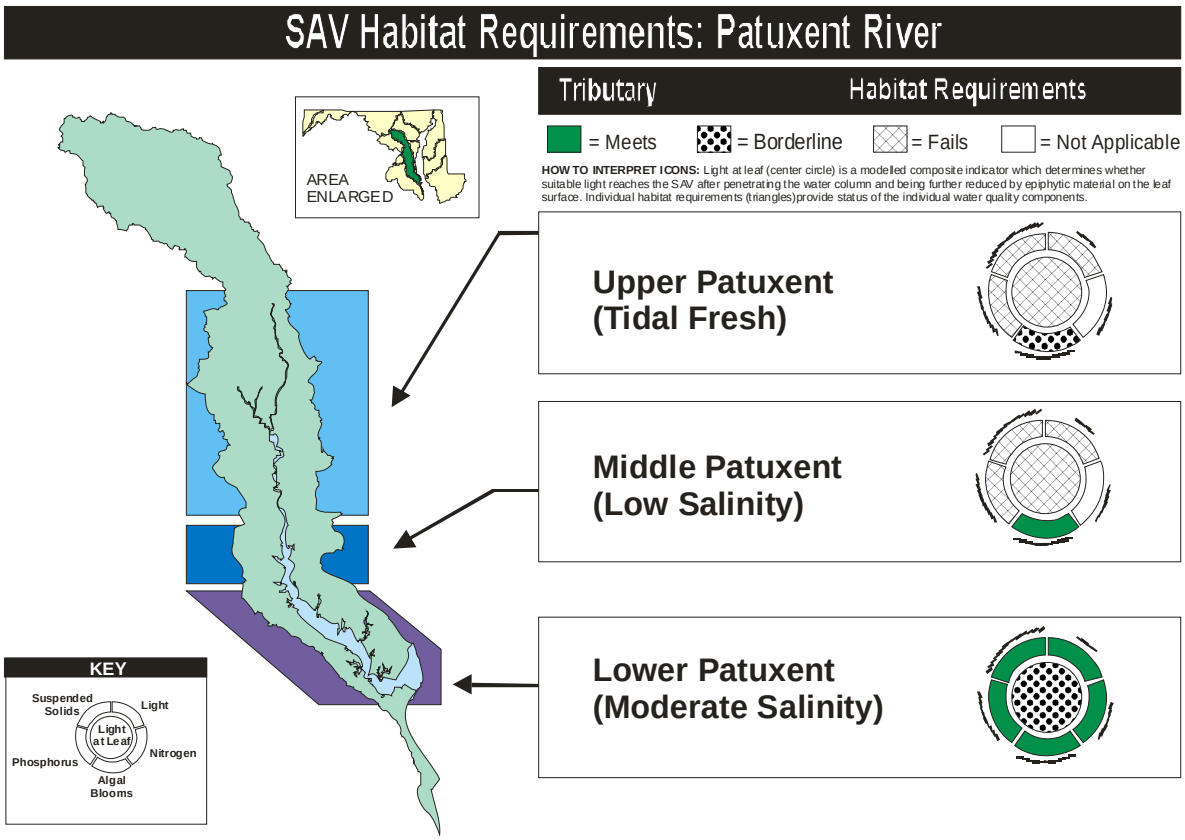

Figure 2: SAV habitat requirement attainment in Patuxent River

References

Assessing water quality with submersed aquatic vegetation. W. C. Dennison, R. J. Orth, K. A. Moore, J. C. Stevenson, V. Carter, S. Kollar, P. Bergstrom and R. A. Batiuk. Bioscience. 1993. 43:86-94.

A perspective on plant-animal interactions in seagrasses: physical and biological determinants influencing plant and animal abundance. R. J. Orth. *In:* D. M. John, S. J. Hawkins, and J. H. Price (eds.). Plant-Animal Interactions in the Marine Benthos. Systematics Special Volume No. 46, Clarendon Press, Oxford, 570 pp. 1992. p. 147-164.

Waterfowl population trends in the Chesapeake Bay area. M. C. Perry and A. S. Deller. *In:* P. Hill and S. Nelson (eds.). Toward a Sustainable Coastal Watershed: The Chesapeake Experiment. Proceedings of a Conference. Chesapeake Research Consortium Publication No. 149, Chesapeake Research Consortium, Inc. Edgewater, Maryland. 1995. p. 490-500.

Habitat Requirements for Submerged Aquatic Vegetation in Chesapeake Bay: Water Quality, Light Regime, and Physical-Chemical Factors. W. M. Kemp, R. Batiuk, R. Bartleson, P. Bergstrom, V. Carter, C. L. Gallegos, W. Hunley, L. Karrh, E. W. Koch, J. M. Landwehr, K. A. Moore, L. Murray, M. Naylor, N. B. Rybicki, J. C. Stevenson and D. J. Wilcox. Estuaries. 2004. 27:363–377.